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STORAGE

REPORT

OF

THE DIRECTOR

OF THE

ROYAL OBSERVATORY, HONGKONG,

FOR THE YEAR

1916

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1917

REPORT OF THE DIRECTOR OF THE ROYAL OBSERVATORY, HONGKONG, FOR THE YEAR 1916.

I.—GROUNDS AND BUILDINGS.

The grounds were kept in order by the Botanical Department with the assistance of the Observatory coolies. The growth of the blue grass (ophiopogon) plantation has been considerably retarded by drought.

Three snakes were killed in the grounds in the month of November; two 6 feet long and one 5 feet long. A fourth was seen, but escaped.

The buildings were repainted in the spring, and the rooms colourwashed.

In the month of October the water supply was improved by the installation of a cistern on the roof.

II.—METEOROLOGICAL INSTRUMENTS.

Kew Barograph.—The instrument was dismounted on March 17, the lens cleaned, and a new glass rod for the temperature compensator fitted.

Beckley Anemograph.—This instrument was oiled once a month, and the orientation of the head checked occasionally.

Dines Anemograph.—The head was oiled once a month, and the spindle of the float cleaned and oiled once a week. The orientation of the head was checked occasionally.

The monthly results of comparisons with the records of the Beckley Anemograph since the installation of the Dines instrument, in April 1910, are given below:—

Month.	Factor (Dines ÷ $\frac{\text{Beckley}}{3}$).						
	1910.	1911.	1912.	1913.	1914.	1915.	1916.
January,	......	2·33	2·30	2·12	2·54	2·03	2·08
February,	......	2·34	2·32	2·30	2·40	2·06	2·23
March,	......	2·30	2·35	2·25	2·33	2·04	2·26
April,	......	2·27	2·33	2·26	2·25	2·05	2·33
May,	2·23	2·25	2·34	2·22	2·13	2·23	2·36
June,	2·23	2·10	2·44	2·09	2·13	2·22	2·26
July,	2·14	2·21	2·57	2·28	2·26	2·05	2·80
August,	2·07	2·25	2·65	2·39	2·18	2·07	2·88
September,	2·18	2·31	2·49	2·81	2·22	2·19	2·21
October,	2·30	2·27	2·51	2·69	2·08	2·23	2·10
November,	2·28	2·27	2·47	2·71	2·08	2·08	2·04
December,	2·23	2·31	2·24	2·54	2·07	2·07	2·10
Year,	2·21	2·29	2·42	2·39	2·22	2·11	2·30

Thermometers.—All thermometers in use were compared with the Kew Standard in winter and summer.

The following table shows the results of comparisons between the Kew Standard purchased in 1884 and a Griffin Standard of Jena Normal Glass purchased in 1914. When compared with the National Physical Laboratory Standard, in April 1914, this thermometer required a correction of 0°·09F., which has been duly applied :—

Date.	Kew Standard 647	Griffin 29996 (*corrected*).	K – G
	°	°	°
1914 July 2, ...	81·82	81·72	+0·10
1915 January 19, ...	60·00	59·86	+0·14
1915 September 29, ...	90·00	89·93	+0·07
1916 January 12, ...	55·00	54·95	+0·05
1916 September 1, ...	80·00	79·88	+0·12
1917 January 16, ...	54·60	54·48	+0·12
1917 January 17, ...	49·41	49·24	+0·17

The results indicate that the Kew Standard No. 647 reads 0°·11 too high; a very small change in thirty years.

III.—METEOROLOGICAL OBSERVATIONS AT THE OBSERVATORY.

Continuous photographic records showing the variations of barometric pressure were obtained with the Kew barograph, and automatic records of the direction and velocity of the wind with a Beckley and a Dines-Baxendell anemograph, modified as described in the Report for 1912. The amount of rain is recorded automatically by a Beckley and a Nakamura pluviograph, the amount of sunshine by a Campbell-Stokes universal sunshine recorder, and the relative humidity of the air by a small Richard hair hygrograph.

Eye observations of barometric pressure, temperature of the air, and of evaporation, were made at each hour of Hongkong Standard time. The character and direction of motion of the clouds were observed every three hours. Daily readings were taken of self-registering maximum and minimum thermometers.

Principal Features of the Weather in 1916.—The principal features of the weather in 1916 were the large departures from normal wind velocity in the different months, and the heavy rains from May 31 to June 13, when 30·675 inches fell, followed by a drought from October 25 to the end of the year, when only $0^{\text{in.}}$·125 of rain fell.

Barometric pressure was considerably below normal in February and June, and considerably above normal in July. The mean pressure for the year was $29^{\text{ins.}}$·832, as against $29^{\text{ins.}}$·836 in 1915 and $29^{\text{ins.}}$·844 for the past 33 years.

The highest pressure was $30^{\text{ins.}}$·332, on January 11, as against $30^{\text{ins.}}$·375 in 1915 and $30^{\text{ins.}}$·509 for the past 33 years. The lowest pressure was $29^{\text{ins.}}$·304, on August 11, as against $29^{\text{ins.}}$·354 in 1915 and $28^{\text{ins.}}$·735 for the past 33 years.

The temperature of the air was considerably below normal in March, and moderately above normal in February, May and August. The mean temperature for the year was 71°·8, as against 73°·4 in 1915 and 71°·8 for the past 33 years. The highest temperature was 92°·4, on August 5, as against 93°·4 in 1915 and 97°·0 for the past 33 years. The lowest temperature was 39°·3, on January 24, as against 41°·7 in 1915 and 32°·0 for the past 33 years.

The wind velocity was above normal in February for the first time since August 1911, (except in July 1914, when it was also slightly above normal). The monthly departures from normal were unusually large in 1916. The mean velocity was considerably above normal in February, March, June, and September, and considerably below in January, April, July, and August. From October to December it was moderately below normal. The mean velocity for the year was 12·2 m.p.h. or 0·6 m.p.h. below normal. This is the greatest mean velocity since 1911, when it was 12·9 m.p.h.

The maximum velocity for one hour, as recorded by the Beckley Anemograph, was 55 miles, at 0^{h} on September 7, as against 56 miles in 1915 and 108 miles for the past 33 years. The maximum squall velocity, as recorded by the Dines-Baxendell Anemograph, was at the rate of 65 m.p.h., at $0^{h}\ 20^{m}$ on September 7, as against 69 m.p.h. in 1915 and 105 m.p.h. for the past 6 years.

As anticipated there has been a partial recovery from the very low wind velocities of 1915, but at present there are no signs of the wind records giving the normal values of former years.

Rainfall at Four Stations.—In the following table the monthly rainfall at the Observatory is compared with the fall at the Police Station, Taipo; the Botanical Gardens; and the Matilda Hospital, Mount Kellet:—

Months.	Observatory (*Kowloon*).	Police Station (*Taipo*).	Botanical Gardens (*Hongkong*).	Matilda Hospital (*Hongkong*).
	inches.	*inches.*	*inches.*	*inches.*
January, ...	4·075	4·87	4·74	5·90
February, ...	1·305	1·30	1·61	1·44
March, ...	0·355	0·48	0·44	0·24
April, ...	4·295	5·52	4·68	6·00
May, ...	12·935	12·49	11·65	16·32
June, ...	32·180	38·62	32·97	26·21
July, ...	8·295	20·03	8·99	9·56
August, ...	5·040	4·43	6·84	5·98
September,...	10·520	13·78	11·10	8·73
October, ...	0·730	1·71	0·78	0·98
November, ...	0·075	—	0·06	0·10
December, ...	0·050	0·03	0·08	0·04
Year,...	79·855	103·26	83·94	81·50

Floods.—The heaviest rainfall occurred as follows:—

Period.					Amount. *Inches.*	Duration. *Hours.*
May	31^{d} 2^{h}	to	June	13^{d} 6^{h}	30·675	117
June	21 12	,,	June	26 0	3·820	19
July	6 1	,,	July	10 11	7·110	22
August	16 22	,,	August	20 17	2·780	16
September	17 3	,,	September	21 8	3·170	12
September	26 3	,,	September	28 8	4·195	17

Landslides occurred in several places during the heavy rains from May 31 to June 13.

Drought.—A serious drought commenced on October 4 and continued till the end of the year. The only rain which fell during this period was 0·595 inch from October 20 to 24, 0·075 inch on November 21 to 22, and 0·050 inch on December 23. Light rain, to the extent of 0·345 inch, fell from January 1 to 8, 1917, but a dry period followed until February 6, when a period of drizzling rain commenced, 0·125 inch falling from February 6 to 12.

Typhoons.—The centre of a small typhoon passed within 20 miles to the west of the Observatory on the morning of June 2. The maximum wind velocity was only 44 miles per hour, however, at 22^{h} on June 1. The maximum wind velocity for the year, 55 m.p.h., occurred during a typhoon which passed about 150 miles to the south of Hongkong on September 6-7.

The tracks of 15 typhoons and 10 of the principal depressions which occurred in the Far East in 1916 are given in two plates in the Monthly Meteorological Bulletin for December 1916.

IV.—PUBLICATIONS.

Daily Weather Report and Map.—A weather map of the Far East and the Daily Weather Report, containing meteorological observations, usually at 6 a.m. and 2 p.m., from about 40 stations in China, Indo-China, Japan, the Philippines, and Borneo, and daily weather forecasts for Hongkong to Gap Rock, the Formosa Channel, the south coast of China between Hongkong and Lammocks, and between Hongkong and Hainan, were issued as in former years. Copies of the map were exhibited on notice boards at the Hongkong Ferry Pier, the Blake Pier, and the Harbour Office. One copy was sent daily to the Director of the Meteorological Observatory, Macao. Forty copies of the Daily Weather Report were distributed to various offices, etc., in the Colony, and a copy was sent daily to the Director of the Meteorological Observatory, Macao. Copies were sent every week to Lieutenant-Commander Pradiyat, Royal Siamese Navy.

The delivery of the Map and Weather Report was accelerated by the employment of an additional coolie on August 1, and in September the two evening papers were placed first on the list of recipients of the Weather Report to ensure its publication.

The weather forecast was telegraphed daily to the Cape d'Aguilar Wireless Station in time for distribution at 1 p.m.

Special Weather Reports.—Special Weather Reports were issued to the Toyo Kisen Kaisha, in connection with the salvage of the "Chiyo Maru", which was wrecked on Lamma Island, to the south west of Hongkong, on March 31.

Monthly Meteorological Bulletin.—The Monthly Meteorological Bulletin, which includes the Daily Weather Report, was distributed to the principal observatories and scientific institutions of the world.

Beginning with January, 1916, the daily and mean hourly values of the principal meteorological elements have been published in both British and C.G.S. Units.

A charge of $10 a year is made for supplying private firms and individuals with the Daily Weather Report.

Miscellaneous Returns.—A monthly abstract of observations made at the Observatory is published in the *Government Gazette*, and daily, monthly, and yearly results are published in the Blue Book in the form suggested by the London Meteorological Office for the British Colonies.

The monthly departures from normal of the barometric pressure at four China Coast Ports were communicated to the Commonwealth Meteorologist, Melbourne, in connection with long range weather forecasts. Monthly meteorological returns are forwarded to Symons's Meteorological Magazine, and annual returns to the Stock Exchange year book and the Colonial Office List.

V.—WEATHER FORECASTS AND STORM WARNINGS.

Daily Weather Telegrams.—Daily weather telegrams from Coast Ports, Indo-China, the Philippines, the Japanese Empire, and Borneo, for the construction of the Daily Weather Map, have been received with commendable regularity throughout the year. The service from Vladivostock, which had been interrupted since July 20, 1915, on account of the war, was resumed on January 14, 1917. Until November 8, the telegrams from Wei-Hai-Wei were frequently received too late to be included in the Map, owing to Government demands on the lines. Since this date they have been received in good time. Telegrams have been received spasmodically from Hoihow, Pakhoi, and a few stations on the Yangtze, but not in time to be included in the Map.

Extra Weather Telegrams.—The following stations send extra weather telegram at half-rates during typhoons, on receipt of certain code words from Hongkong:—Amoy, Canton, Macao, Phulien, Sharp Peak, and Taihoku. The Director of the Philippines Weather Bureau also sends extra telegrams at his discretion from Aparri or some other station nearer the typhoon centre.

The extra 9 p.m. telegram usually received from Swatow during the typhoon season, was only sent occasionally, owing probably to the disturbed condition of the country.

Wireless Weather Telegrams.—The development of this service has been impeded by the war. Wireless weather telegrams have been received from Japanese and Dutch ships, however, as follows:—

Month.	*Dutch.*	*Japanese.*
January,	8	7
February,	7	4
March,	8	9
April,	11	4
May,	4	4
June,	8	4
July,	7	3
August,	9	5
September,	7	7
October,	6	4
November,	9	6
December,	11	3
Total,	95	60

Telegraphic Code.—The six-letter code for daily weather telegrams, which was brought into use on February 15, 1915, has continued to give satisfaction. The Director of the Japanese Weather Bureau reports that he is still unable to introduce the code for transmitting the Japanese telegrams, or to substitute the 12 stations agreed upon at the Tokio Conference of 1913 in place of the 10 stations now reporting.

Results of Weather Forecasts.—The results of the comparison of the daily weather forecasts with the weather subsequently experienced are given below, with the results of the previous five years:—

Year.	Complete Success.	Partial Success.	Partial Failure.	Total Failure.
	%	%	%	%
1911	55	32	11	2
1912	62	34	3	1
1913	66	28	3	3
1914	62	32	5	1
1915	54	37	8	1
1916	67	29	3	1

Storm Warnings.—Storm warnings according to the "China Coast" code, and the local code, are displayed at Blackhead's Hill, Kowloon, when necessary. Others according to the Hongkong telegraphic code are sent to the following ports:—Sharp Peak, Amoy, Swatow, Macao, Canton, Pakhoi, Hoihow, Phulien, Manila, Labuan, and Singapore. The local warnings are repeated at the Harbour Office, H.M.S. "Tamar", Green Island, and the Godown Company, Kowloon. For vessels taking shelter in Kowloon Bay and to the West of Stonecutters Island, they are also repeated at Lyemun by the military authorities, and at Lai-Chi-Kok by the Standard Oil Company.

The local night signals were transferred from the Water Police Station to the tower of the Kowloon Railway Station in the month of May.

For the benefit of native craft and passing ocean vessels, a cone is exhibited at several outlying stations during the time that any of the above Day Signals are displayed in the Harbour, to indicate that there is depression somewhere in the China Sea, and that a Typhoon Warning is displayed in the Harbour.

In the following table are given the number of hours the local signals were hoisted in each of the years 1912-1916:—

Year.	Red Signals.	Black Signals.	Bombs.
	Number of hours.		Number of times fired.
1912	151	164	...
1913	146	189	1
1914	146	178	...
1915	64	120	...
1916	70	201	1

The red signals indicate that the centre of the typhoon is believed to be more than 300 miles distant, and the black less than 300 miles. Three bombs fired at intervals of 10 seconds indicate that winds of typhoon force are anticipated.

The figures in the above table include the number of hours that night signals, corresponding to the red and black day signals, were hoisted.

VI.—METEOROLOGICAL OBSERVATIONS FROM SHIPS, TREATY PORTS, &c.

Logs received.—In addition to meteorological registers kept at about 40 stations in China, meteorological logs were received from 158 ships operating in the Far East. These logs, representing 7,456 days' observations, have been utilised for determining typhoon tracks and for those squares of the proposed Pilot Charts for which information is lacking. The corresponding figures for the year 1915 were 163 and 9,254.

No progress has been made with the construction of Pilot Charts owing to the absence on leave of the Chief Assistant.

Comparison of Barometers.—During the year about 1,300 comparisons of ships' barometers have been made by means of observations taken when in harbour, and several direct comparisons of barometers for shipmasters and various persons in the Colony have been made at the Observatory.

VII.—Magnetic Observations.

Absolute determinations of magnetic horizontal force and declination were made near the middle of each month with a Kew pattern magnetometer, Elliott No. 55, and of dip with a Kew pattern dip circle, Dover No. 71, four dip needles being used in rotation. A complete determination of horizontal force consists of one set of vibrations taken between two sets of deflections.

Kew Magnetometer, Elliott No. 83, which was sent to England to be altered in 1914, was received back in February. It has been much improved.

From 7 comparisons made at the Kew Observatory in February, June, and July, 1915, it appeared that, with vibration magnet 83 and mirror magnet 83c, Elliott No. 83 gave smaller values of X than the Kew Standard by 22γ. (In the Annual Report for 1915 the difference is given as 30γ, but Dr. Chree informs me that the standard values of X originally furnished should be reduced by 8γ, on account of the difference between the provisional values of K, P, and Q, and those finally adopted for the year 1915.)

From four comparisons made in December 1916, it appeared that Elliott No. 55 gives smaller values of X than Elliott No. 83 (with vibration magnet 83) by 22γ, indicating that Elliott No. 55 gives results 44γ smaller than the Kew Standard. No correction has been made in this or any previous Report, however, to the results obtained from Elliott No. 55.

From a report on the results of comparisons of the Hongkong Magnetic instruments with those of the Carnegie Institute, Washington, made at this Observatory in the spring of 1915, it appears that the published values of X by Elliott No. 55 are lower than the International Magnetic Standard by $42{\cdot}4\gamma$, indicating that the I.M.S. agrees very closely with the Kew Standard.

As regards declination, Elliott No. 55 gave values $0'{\cdot}4$ lower than the I.M.S., and as regards dip, Dover No. 71 gave values $1'{\cdot}8$ greater than the I.M.S.

VIII.—Time Service.

Time Ball.—The Time Ball on Blackhead's Hill is dropped daily at 13^h, Hongkong Standard Time (5^ha.m. of Greenwich Time). The ball is also dropped at any other hour in case of necessity. One application for a supplementary time signal was made in the year 1916.

The ball was dropped successfully 359 times. There were two failures. On May 23, on hoisting the ball it was found that the shaft had worked loose in its plunger, and it was considered unadvisable to allow the ball to fall until the necessary repairs had been effected. On December 23 the lock failed to discharge owing to incorrect tension of one of the springs.

The apparatus was under repair on January 29, and from May 25 to 28.

The ball fell with an error of 0·3 or less on 332 occasions, and with an error of 0·4 or 0·5 on 20 occasions. Errors of 0·6, 0·7, 0·9, 1·0, and 1·2 occurred once, and of 0·8 twice.

The probable error of the Time Ball for the whole year, ± 0·14, was the smallest on record. The monthly values for the past five years were as follows:—

Month.	Probable error of Time Ball.				
	1912	1913	1914	1915	1916
January,	±0·33	±0·20	±0·18	±0·17	±0·15
February,	·28	·21	·15	·44	·28
March,	·14	·54	·21	·17	·17
April,	·13	·21	·22	·38	·18
May,	·11	·11	·25	·16	·19
June,	·18	·15	·16	·13	·17
July,	·13	·17	·20	·17	·10
August,	·12	·15	·21	·15	·10
September,	·16	·10	·14	·13	·11
October,	·12	·12	·14	·10	·13
November,	·21	·17	·13	·16	·13
December,	·27	·26	·28	·14	·11
Means,	±0·18	±0·20	±0·19	±0·19	±0·14

Transit Instrument.—Observations for time were made daily with the 3-inch transit instrument and the Hipp tape chronograph by the Chinese computers, weather permitting.

The number of observations in the years 1915 and 1916 were as follows:—

	1915.	*1916.*
Transits, ...	1,817	1,778
Level determinations,	851	890
Azimuth determinations,	32	34
Collimation determinations,	30	33

Transits of the sun were only observed when star transits were not available from the previous night.

The azimuth and collimation determinations were made by the Director, the Chief Assistant, and the First Assistant. The azimuth determinations depend usually on observations of the old south mark.

An examination of the old south mark, on April 11, showed that the obelisk had tilted 1·75 inches to the West. The two black dots which formerly served as the observing mark, and which are situated half way up the obelisk, have therefore shifted $0^{\mathrm{m}}{\cdot}875$, which is equivalent to $0^{\mathrm{s}}{\cdot}088$, the distance from the mark to the transit instrument being 11,354 feet.

On March 7 the new south mark was lowered 2½ feet, and its collimating lens by a corresponding amount, in order to obtain a clear view of the old south mark. Formerly some of the rays from the latter were intercepted by the pillar of the new south mark.

The collimation error derived from the old south mark now usually agrees with that derived from the other marks to within the probable error of observation.

Clocks.—The performance of the standard sidereal clock, Dent No. 39741, has been exceptionally good, and appears to have justified the substitution of the invar pendulum mentioned last year. A discussion of the rates for the year 1916, by the method of least squares, indicates that the barometer coefficient is $0^{\mathrm{s}}{\cdot}676$ (increase of losing rate for an increase of 1 inch of barometer), and the temperature coefficient $0^{\mathrm{s}}{\cdot}0026$ (increase of losing rate for an increase of 1°F).

As, however, the variations of temperature follow very closely those of barometric pressure, it is doubtful whether this large barometer coefficient, which is about double the theoretical value, is correct. With the data available it is not possible to differentiate correctly between the effect of temperature and the effect of barometric pressure.

As a compromise, therefore, between the theoretical and the computed barometer coefficient, the value $0^{\mathrm{s}}{\cdot}4$ has been adopted.

On this assumption the clock rate may be expressed by the formula $r = r_0 + 0{\cdot}4\ (p_0 - p) - 0{\cdot}00392\ (t_0 - t)$

where r is the losing rate at the pressure p, in inches; and the temperature t, in degrees Fahrenheit

and r_0 the losing rate at the pressure p_0, and temperature t_0.

It is proposed to use the above formula during cloudy periods in the year 1917.

There is no evidence of a humidity coefficient.

In the month of February experiments were made to determine the effect of the electric sidereal clock on the rate of the Standard sidereal clock, which is on the same pillar, the electric clock being on the north, and the standard clock on the west side. No effect on the arc of the standard clock could be detected, either with large or small swings of the electric clock pendulum, or with the pendulums in "coincidence" or "opposition".

In the following table is given the excess of the observed over the inferred rate after cloudy periods in the year 1916.

Excess of observed over calculated errors of Dent No. 39741, after cloudy periods in the year 1916.

Date 1916.		Interval without observations.	Excess of observed over calculated error.	Date 1916.		Interval without observations.	Excess of observed over calculated error.
		days.	s.			*days.*	s.
January	6	3	+0·48	May	17	2	0·00
..	24	2	−0·20	..	22	2	+0·24
February	5	2	+0·26	June	11	12	+0·35
..	12	6	+0·28	July	8	2	+0·10
..	22	5	+1·20	August	17	3	+0·02
..	27	4	+0·16	September	7	2	−0·03
March	4	5	−0·64	..	23	2	+0·07
..	18	13	+0·35	..	27	4	−0·18
..	24	5	−0·08	October	2	2	−0·21
..	30	4	−0·11	..	21	2	+0·15
April	4	4	+0·44	..	27	3	+0·06
..	11	3	+0·41	December	20	3	+0·20
..	18	2	+0·30	..	27	2	−0·07

The mean time clock, Dent No. 39740, which was fitted with an invar pendulum in 1915, has kept a fairly satisfactory rate throughout the year.

A discussion of the monthly rates for 1916, using a barometer coefficient of 0·4, as in the case of the sidereal standard clock, gives a temperature coefficient of $0^s{\cdot}0121$, decrease of losing rate for an increase of 1° (F) of temperature.

The Brock clock has been used throughout the year for dropping the Time Ball and for driving dials in various parts of the building, except from October 27 to November 7, when Dent No. 39740 was used for this purpose. In spite of the invar pendulum fitted in 1914, the rate has been erratic at times, after keeping remarkably steady for several days. The clock is corrected daily by the electric regulating apparatus, and its daily rate is usually kept below $0^s{\cdot}5$ by the addition or removal of weights to or from the pendulum.

Further experiments with the electric sidereal clock indicated that the best working conditions are with an angle of impulse $\beta = -12'$ and $\gamma = +74'$, giving an arc of about 160′. The clock is now out of commission, pending the construction of an underground room for all the clocks. It will then be required for driving a dial in the transit room.

In the month of October the minute dials missed occasionally. The fault was traced to the Edison-Lalande cells which operate the minute relay circuit. Dry cells were substituted and the dials have since worked without failure.

Since March 23 an hourly time signal has been sent to the Water Police Station, the General Post Office, and the Cable Company's Office, along the lines used for the telephone or telegraph instruments, by means of apparatus designed by the Government Electrician. An electro-magnet receives a current every hour from the mean time clock and, by means of contacts on the armature, short-circuits these lines for about 0·8 second.

Batteries.—The Edison-Lalande cells which were purchased for use alternatively with the accumulator on some circuits, have proved a failure. In some cells the zincs have been eaten through at the level of the potash, and others have become exhausted, though called upon to do but very little work.

The accumulators have given satisfaction throughout the year. Additions to the sulphuric acid have been made occasionally, as required. The ammonium phosphate requires filtration after about two months' work.

Time Signals by Wireless Telegraphy.—A tuner and detector, with a high resistance telephone, were received in the month of March. They were tested by the Port Wireless Officer and found satisfactory; but the Audion amplifier, purchased by the Crown Agents from Messrs. A.W. Gamage, was found useless, so was returned to the makers.

The Marconi Company have been asked to quote for the installation of antennae and mast for the receipt of wireless time-signals in accordance with a specification prepared by the Port Wireless Officer.

Owing to the war, Messrs. L. Leroy & Cie., Paris, were unable to supply the distributing apparatus ordered in January, 1916.

IX.—SPECIAL INVESTIGATIONS.

Winter Droughts at Hongkong.—An investigation into the weather conditions in China, Siberia, India, South Africa and South America prior to winter droughts at Hongkong, yielded no evidence of a correlation by which these droughts might be predicted.

The Wind at the Victoria Peak.—The tabulation of the anemograph records at Victoria Peak, Hongkong, has been commenced.

An examination of the records has shown how necessary are the modifications to the Standard pattern of Beckley's Anemograph, mentioned in the Introduction to the Monthly Meteorological Bulletin for January, 1913. A start has been made by graduating the drums of the crown wheels which drive the velocity and direction pencils, the former to miles and the latter to points. A worm wheel has also been fitted to record the revolutions of the velocity pencil on a dial. The other necessary modifications have not yet been made. A discussion of the records promises to be of considerable interest. The two years already tabulated show that the diurnal inequality of the wind velocity at Victoria Peak is quite different to that at Kowloon.

The Climate of Hongkong.—A memoir on the climate of Hongkong was published on July 12.

Rainfall Maps of China.—Provisional monthly rainfall maps of China have been constructed; principally from data published by the Zikawei Observatory, and the records from stations of the Chinese Maritime Customs.

The results show that the wettest area is near the mouth of the Yangtze in January, becoming more and more south until in May the wettest district is a little to the north of Hongkong. In June it is farther north, and in July is in the neighbourhood of Pakhoi, in August and September it is apparently slightly to the south of Hongkong. In October and November it lies over the lower Yangtze Valley, and in December its position is doubtful, but probably somewhere between the lower Yangtze Valley and the south coast of China.

The driest area is in the neighbourhood of the Gulf of Pechili in each month. The wettest month is June and the driest is December.

Returns from many more stations are necessary before detailed rainfall maps can be constructed. On May 18 a five-inch raingauge was sent to the Rev. O. Van De Velde, of the Roman Catholic Mission at Hokiao, Ortos, Mongolia, who had for several years noted the number of rainy days at his station, and after each fall of rain measured the depth to which it had penetrated into the ground, having no raingauge. Father Van De Velde now measures the rain or snow fall daily, and very kindly forwards the returns to Hongkong every month.

Level Bubbles.—An examination of three level bubbles supplied by Messrs. Troughton and Simms as highest grade instruments, shewed that the scale value of each was very irregular, and that over the irregular portions of the tubes the amount of movement of the spirit for a given tilt varied very considerably according to the direction of motion of the spirit, and the scale reading at the instant of tilting. It appears to be impossible therefore to construct a satisfactory table showing the angular value of different scale readings, when the bubble tube is irregular.

X.—Miscellaneous.

Staff.—No change occurred in the European staff during the year. Mr. C. W. Jeffries, the Chief Assistant, was on leave of absence from February 14 to November 5. During this period, Mr. B. D. Evans, the First Assistant, acted as Chief Assistant.

The Director acted as a censor of cablegrams from January 5 to December 31, Mr. Jeffries from January 1 to February 9, and from December 7 to December 31, and Mr. Evans throughout the year.

Li Yung-shing, telegraphist, was promoted to the Radio-telegraph Station on March 1. The vacancy thus caused was filled by the appointment of Yuen Lai-sang.

Expenditure.—The annual expenditure on the Observatory for the past ten years is as follows:—

Year.	Total Expenditure.	Increase.	Decrease.
	$ c.	$ c.	$ c.
1907	20,110.53	115.36	......
1908	21,110.61	1,000.08	......
1909	22,388.63	1,278.02	......
1910	21,787.55	......	601.08
1911	23,353.02	1,565.47	......
1912	22,595.08	......	757.94
1913	24,255.49	1,660.41	......
1914	25,398.31	1,142.82	......
1915	23,233.12	......	2,165.19
1916	21,977.78	......	1,255.34

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T. F. Claxton,
Director.

1917, February 26.